BCMV: CIAT'S POINT OF VIEW

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Prior to 1985.

The principle strategy of the Bean Program at CIAT during the first ten years of operation was to incorporate the I gene into all CIAT breeding lines and major disease resistance sources. The I gene had been shown to be effective in controlling BCMV in Latin America where only mosaic inducing strains were considered to be important; although, it was known that the NL3 necrotic strain was present in Chile, and occasionally, individual plants would show black root symptoms in the field at CIAT's research station in Palmira.

During the late 1970's, a collaborative project between CIAT and Dr. Drijfhout of IVT, Wageningen was begun to incorporate the I, bc2.2 and bc3 genes for resistance to mosaic and necrosis inducing strains of BCMV into tropically adapted materials. The project ended after three cycles of backcrossing were completed and the first advanced lines (coded MCM for multiple common mosaic resistance) entered into the VEF88.

After 1985.

The I gene in CIAT's elite breeding lines and disease resistance sources became a problem when the Bean Program began shipping nurseries to the newly begun regional projects in the Great Lakes, Eastern, and Southern regions of Africa. From the first planting made in Rwanda, I gene containing breeding lines began dying with black root, and shortly thereafter, it became obvious that necrosis-inducing strains of BCMV were wide spread in Africa and that a more aggressive BCMV resistance strategy was going to be needed. In the meanwhile, certain countries such as Uganda, preferred to receive fully susceptible BCMV lines, over those containing I gene.

Virus surveys were begun and the initial results showed that throughout Eastern, Great Lakes, and Southern Africa regions, with the exception of certain countries such as Ethiopia, and possibly Zimbabwe, the necrosis inducing NL3 strain predominated throughout the region (Spence and Walkey, 1990; Vetten and Allen, 1990), corroborating what had already been observed in the germplasm introduction nurseries.

The BCMV-recessive resistance breeding program at CIAT headquarters became a high priority project for Africa. The MCM lines from the CIAT-IVT project formed the base for further crosses, along with the bc3 gene from the Spanish line 'Don Timoteo' (G13936). Further cycles of crossing were begun to produce lines with better combinations of agronomic traits as well as resistance to other diseases needed for Africa. At present there are over 150 lines with resistance to the BCMV necrosis-inducing strains. The original system used to code advanced lines coming out of this project was based on the type and number of BCMV genes present in a line:

MCM lines:	I + bc2.2 + bc3
	I + bc3
	I + bc2
MCR lines:	bc3 gene only
MCD lines:	I gene only

These lines were organized into three different International Bean Common Mosaic Virus-Black Root Nurseries (IBCMVBRN):

IBCMVBRN	No.1:	primarily differential varieties (Drijfhout, 1978)
	No.2:	64 entries (MCM, MCR)
	No.3:	49 entries (MCM, MCR)

Future lines, however, will be coded differently. It is no longer possible to keep track of all the different recessive genes (and I gene) which may be present in the black root resistant lines without resorting to test crosses. At this time, test crossing is not practical considering the number of selections and lines being developed each year. The new lines will simply be coded as BRB (black root, bush) and BRC (black root, climbers). It is hoped that within the next few years, molecular markers will be available to enable us to identify the different genetic combinations that are available in the materials.

1990 - New Problems.

The I gene may be vulnerable to more viruses than just the necrotic stains of BCMV. Bean Severe Mosaic Virus (BSMV) complex, transmitted by Chrysomelid beetles, is a growing problem in certain areas of Central America. This virus also causes a hypersensitive reaction in cultivars possessing the I gene, even if the I gene is protected by recessive BCMV genes (F. Morales, personal communication).

It is possible that the I gene will have to be removed from bean lines being developed for this region in the future. To protect these same lines from BCMV, only recessive resistance genes would be used.

References:

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